CLAIMS

1. A propulsion system for use in a hybrid vehicle, comprising:

an internal combustion engine; and

a propulsion system controller for actuating said propulsion system, said propulsion system controller varying the operating conditions of an electric motor/generator system in response to a state-of-charge of an electrical storage medium of said vehicle.

2. The propulsion system as in claim 1, wherein said propulsion system controller varies the operating conditions of said electric motor/generator system in response to the state of use of said electric motor/generator.

3. The propulsion system as in claim 1, wherein said propulsion system controller varies the operating conditions of said electric motor/generator system in response to the engine coolant temperature of said internal combustion engine.

4. The propulsion system as in claim 2, wherein said propulsion system controller varies the operating conditions of said electric motor/generator system in response to the engine coolant temperature of said internal combustion engine.

5. The propulsion system as in claim 1, wherein said electric motor/generator system is configured to provide/receive a driving force from a crankshaft of said internal combustion engine.

6. A propulsion system controller for use in a hybrid vehicle, comprising:

a means for sensing the state-of-charge of an electric storage medium;

a means for sensing the temperature of an engine coolant of an internal combustion engine; and

a motor/generator for providing starting force to said internal combustion engine in a first mode of operation and for generating an electrical charge and a second mode of operation, said propulsion system controller instructing said motor/generator to operate in between said first and said second modes of operation.

7. A propulsion system controller for use in a hybrid vehicle, comprising:

a first operating system;

a second operating system;

a means for sensing the state-of-charge of an electric storage medium, said means for sensing the state-of-charge of said electric storage medium being operated by said first operating system;

a means for sensing the temperature of an engine coolant of an internal combustion engine, said means for sensing the temperature of said engine coolant being operated by said first operating system; and

a motor/generator for providing starting force to said internal combustion engine in a first mode of operation and for generating an electrical charge and a second mode of operation, said first operating system and said second operating system instructing said motor/generator to operate in between said first and said second modes of operation.

8. A method for operating a propulsion system of a hybrid vehicle, comprising:

determining if an engine starting command has been requested;

sensing the state-of-charge of an electric storage medium;

sensing the temperature of an engine coolant of an internal combustion engine; and

operating a motor/generator in a first mode of operation for providing a starting force to said internal combustion engine and in a second mode of operation for generating an electrical charge.

9. The method as in claim 8, wherein said first mode of operation of said motor/generator is varied in response to the state-of-charge of said electric storage medium.

10. The method as in claim 8, wherein said first mode of operation of said motor/generator is varied in response to the engine coolant temperature of said internal combustion engine.

11. The method as in claim 9, wherein said first mode of operation of said motor/generator is varied in response to the engine coolant temperature of said internal combustion engine.

12. The method as in claim 11, further including:

varying the rate of a prime pulse during a starting sequence of said internal combustion engine, said prime pulse being varied in response to the value of the state-of-charge of said electrical storage medium and the engine coolant temperature of said internal combustion engine.

13. The method as in claim 11, further including:

varying the rate of a prime pulse and the starting force being applied to said internal combustion engine during a starting sequence of said internal combustion engine.

14. The method as in claim 13, wherein said internal combustion engine is started with a low RPM and a prime pulse when the state-of-charge is below a predetermined value indicating a low state-of-charge and the engine coolant temperature is below a predetermined value indicating a low engine coolant temperature.

15. The method as in claim 13, wherein said internal combustion engine is started with a low RPM and a medium prime pulse when the state-of-charge is below a predetermined value indicating a low state-of-charge and the engine coolant temperature is in a range defined by predetermined values indicating a medium engine coolant temperature.

16. The method as in claim 13, wherein said internal combustion engine is started with a low RPM and a minimal prime pulse when the state-of-charge is below a predetermined value indicating a low state-of-charge and the engine coolant temperature is above a predetermined value indicating a medium engine coolant temperature.

17. The method as in claim 13, wherein said internal combustion engine is started with a low RPM and a prime pulse when the state-of-charge is in a medium range defined by a pair of predetermined values indicating a medium state-of-charge and the engine coolant temperature is below a predetermined value indicating a low engine coolant temperature.

18. The method as in claim 13, wherein said internal combustion engine is started with a medium RPM and a minimal prime pulse when the state-of-charge is in a medium range defined by a pair of predetermined values indicating a medium state-of-charge and the engine coolant temperature is in a medium temperature range defined by a pair of predetermined values.

19. The method as in claim 13, wherein said internal combustion engine is started with a medium RPM when the state-of-charge is in a medium range defined by a pair of predetermined values indicating a medium state-of-charge and the engine coolant temperature is above a medium temperature range defined by a pair of predetermined values.

20. The method as in claim 13, wherein said internal combustion engine is started with a high RPM when the state-of-charge is above a medium range defined by a pair of predetermined values indicating a medium state-of-charge and the engine coolant temperature is above a low temperature defined by a predetermined value.

21. The method as in claim 13, wherein said internal combustion engine is started with a low RPM and a prime pulse when the state-of-charge is above a medium range defined by a pair of predetermined values indicating a medium state-of-charge and the engine coolant temperature is below a low temperature defined by a predetermined value.

22. A method for operating a propulsion system of a hybrid vehicle, comprising:

determining if an engine starting command has been requested;

sensing the state-of-charge of an electric storage medium;

sensing the temperature of an engine coolant of an internal combustion engine;

operating a motor/generator in a first mode of operation for providing a starting force to said internal combustion engine and in a second mode of operation for generating an electrical charge;

varying the starting speed of said motor/generator in said first mode in response to the state-of-charge of said electric storage medium; and

varying a prime pulse to said internal combustion engine in response to the state-of-charge of said electric storage medium.

23. The method for operating a propulsion system as in claim 22, wherein the step of determining if an engine starting command has been requested includes monitoring the position of a shifter of said vehicle, monitoring said internal combustion engine RPM, monitoring the position of an ignition key, and monitoring the voltage of said electric storage medium.

24. The method for operating a propulsion system as in claim 22, wherein said operating force of said motor/generator in said first mode is varied in response to the speed of said internal combustion engine over time during a starting sequence.

25. A method for varying the state of a propulsion system of a hybrid vehicle, comprising:

determining if an engine starting command has been requested;

sensing the state-of-charge of an electric storage medium;

sensing the temperature of an engine coolant of an internal combustion engine;

sensing the temperature of said electric storage medium;

determining if a fault condition is present;

sensing the operating condition of a motor/generator; and

varying a degree of electric power being used to drive said vehicle, said degree of electric power corresponding to sensed vehicle operating conditions.

26. The method as in claim 25, further comprising:

operating a motor/generator in a first mode of operation for providing a starting force to said internal combustion engine and in a second mode of operation for generating an electrical charge;

varying the starting speed of said motor/generator in said first mode in response to the state-of-charge of said electric storage medium; and

varying a prime pulse to said internal combustion engine in response to the state-of-charge of said electric storage medium.

27. The method as in claim 25, wherein the step of determining if an engine starting command has been requested includes monitoring the position of a shifter of said vehicle, monitoring said internal combustion engine RPM, monitoring the position of an ignition key, and monitoring the voltage of said electric storage medium.

28. A propulsion system controller for use in a hybrid vehicle, comprising:

a motor/generator for providing starting force to an internal combustion engine in a first mode of operation and for generating an electrical charge in a second mode of operation;

a first operating system, said first operating system varying the prime pulse to an internal combustion engine and the starting force applied to said internal combustion engine by said motor/generator, said operating system varying the staring force and the prime pulse according to engine coolant temperature and battery state-of-charge;

a second operating system, said second operating system varying the state of operation of said motor generator during a starting sequence of said internal combustion engine, said first operating system and said second operating system instructing said motor/generator to operate in between said first and said second modes of operation;

a third operating system, said third operating system varying a degree of electric power being used to drive said vehicle, said degree of electric power corresponding to sensed vehicle operating conditions;

a means for sensing the state-of-charge of an electric storage medium, said means for sensing state-of-charge of said electric storage medium being operated by said first operating system; and

a means for sensing the temperature of an engine coolant of an internal combustion engine, said means for sensing the temperature of said engine coolant being operated by said first operating system.